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ning of each regular issue of the PCT Gazette.*

(54) Title: CASE-HARDENING OF STAINLESS STEEL

(57) Abstract: The invention relates to case-hardening of a stainless steel article by means of gas including carbon and/or nitrogen, whereby carbon and/or nitrogen atoms diffuse through the surface into the article. The method includes activating the surface of the article, applying a top layer on the activated surface to prevent repassivation. The top layer includes metal which is catalytic to the decomposition of the gas.



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INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 C23C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EP0-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	NL 1 003 455 A (RIJKSUNIVERSITEIT GRONINGEN TE GRONINGEN) 2 March 1998 (1998-03-02) page 5, line 30 -page 6, line 13; claims 1,2,7,9-15,18 ---	1-3,6-11
X	US 4 013 487 A (RAMQVIST LARS H ET AL) 22 March 1977 (1977-03-22) column 2, line 13 -column 5, line 7 ---	1,2,4-6, 8-11
X	DATABASE WPI Section Ch, Week 198408 Derwent Publications Ltd., London, GB; Class M13, AN 1984-045734 XP002262970 & JP 59 006367 A (NICCHI KK), 13 January 1984 (1984-01-13) abstract --- -/--	1,2,4-6, 8-11

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 248 431 B (POLITECHNIKA KRAKOWSKA ;SAMOCHODOW MALOLITRAZOWYCH POL (PL)) 9 December 1987 (1987-12-09) page 4, line 6 - line 37 ---	1,2,9-11
X	DD 294 048 A (FREIBERG BERGAKADEMIE) 19 September 1991 (1991-09-19) page 1, line 27 -page 2, line 11; claims 1,2 ---	1,2,9-11
X	WO 01 55470 A (MARX STEVEN V ;SWAGELOK CO (US); WILLIAMS PETER C (US)) 2 August 2001 (2001-08-02) page 2, line 6 -page 3, line 19 page 5, line 4 - line 21 page 16, line 1 - line 14; claims 1,25 ---	1,2,9-11
A	page 16, line 1 line 14 ---	5
X	WO 00 50661 A (MARX STEVEN V ;SWAGELOK CO (US); WILLIAMS PETER C (US)) 31 August 2000 (2000-08-31) page 2, line 13 -page 4, line 2 page 5, line 10 -page 6, line 13 page 8, line 20 -page 9, line 12 ---	1,2,9-11
A	page 5, line 10 -page 6, line 13 -----	5

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
NL 1003455	A	07-01-1998	NL 1003455 C2	07-01-1998
US 4013487	A	22-03-1977	AT 344223 B	10-07-1978
			AT 177875 A	15-11-1977
			AU 7902775 A	16-09-1976
			BE 826720 A1	30-06-1975
			BR 7501485 A	16-12-1975
			CA 1057175 A1	26-06-1979
			DE 2510329 A1	23-10-1975
			DK 100975 A	15-09-1975
			FI 750718 A ,B,	15-09-1975
			FR 2264105 A1	10-10-1975
			GB 1452257 A	13-10-1976
			IT 1030338 B	30-03-1979
			JP 1242473 C	26-11-1984
			JP 50157231 A	19-12-1975
			JP 59018473 B	27-04-1984
			NL 7503102 A	16-09-1975
			NO 750846 A ,B,	16-09-1975
			SE 7403411 A	15-09-1975
JP 59006367	A	13-01-1984	JP 1363722 C	09-02-1987
			JP 61031183 B	18-07-1986
EP 0248431	B	09-12-1987	PL 147547 B1	30-06-1989
			CS 8704119 A2	12-02-1991
			DD 263308 A5	28-12-1988
			DE 3787672 D1	11-11-1993
			EP 0248431 A2	09-12-1987
DD 294048	A	19-09-1991	DD 294048 A5	19-09-1991
WO 0155470	A	02-08-2001	US 6547888 B1	15-04-2003
			AU 3118801 A	07-08-2001
			CA 2398675 A1	02-08-2001
			CN 1423709 T	11-06-2003
			EP 1259657 A2	27-11-2002
			JP 2003525348 T	26-08-2003
			WO 0155470 A2	02-08-2001
WO 0050661	A	31-08-2000	US 6093303 A	25-07-2000
			AT 228176 T	15-12-2002
			AU 5559999 A	14-09-2000
			DE 69904049 D1	02-01-2003
			DE 69904049 T2	24-04-2003
			EP 1095170 A1	02-05-2001
			JP 2003517516 T	27-05-2003
			WO 0050661 A1	31-08-2000
			US 6461448 B1	08-10-2002